MATERIAL SAFETY DATA SHEET

2,4,6-Trinitrotoluene

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

International Chemical Identification	2,4,6–trinitrotoluene; TNT
Index Number	609-008-00-4
Number EC	204-289-6
Number CAS	118-96-7
Number ONZ	0209
Another name	Trotyl, TNT, 2,4,6-trinitrotoluen, 2-methyl-1,3,5-trinitrobenzene
Chemical name	$C_7H_5N_3O_6$
Registration number	01-2119860061-49-0000 **The registration number for tonnage band under 10 tonnes/year; obligation to update registration dossier under 1000 tonnes/year – deadline to 1st June 2013.**

1.2. Relevant identified uses of the substance or mixture and uses advised against

bursting explosive

1.3. Details of the supplier of the safety data sheet

Zakłady Chemiczne „NITRO-CHEM" S.A. 85-825 Bydgoszcz, ul. Wojska Polskiego 65a
tel. (052) 374 76 60, fax. (052) 361 11 24
Person responsible for the Material Safety Data Sheet:
Beata Wasilewska, e-mail : wasilewska@nitrochem.com.pl
Teresa Soczka, e-mail: t.soczka@nitrochem.com.pl

1.4. Emergency telephone number

tel. (052) 374 76 60 (weekday 7.00 a.m. – 3.00 p.m.)
tel. (01) 406 43 43 – Poisoning Head Office in Wien: Vergiftungsinformationzentrale VIZ

SECTION 2: Hazard Identification

Risks

- Explosive; mass explosion hazard.
- Toxic by inhalation, in contact with skin or if swallowed.
- May cause damage to organs *(liver, eyes, nervous system, circulatory system)* through prolonged or repeated exposure.
- Toxic to aquatic life with long lasting effects.

Fire hazards

High bursting explosive. Risk of explosion by shock, friction or fire. Burning of small amounts in the open is safe burning of small amounts in a closed area or burning of large amounts results in explosion

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2.1. Classification of the substance or mixture

According to Regulation (EC) No 1272/2008 (CLP)	
Hazard Class and Category Code(s) (read in point 16)	Hazard statement Code(s) (read in point 16)
Expl. 1.1	H201
Acute Tox. 3	H331
Acute Tox. 3	H311
Acute Tox. 3	H301
STOT RE 2	H373
Aquatic Chronic 2	H411
According to Directive 67/548/EEC	
Warning symbols (read in point 16)	Danger symbols (R) (read in point 16)
E	R2
T	R23/24/25
	R33
N	R51-53

2.2. Label elements

2,4,6-trinitrotoluene; TNT
Index No**:** 609-008-00-4

DANGER

H201 Explosive; mass explosion hazard.
H301 Toxic if swallowed.
H311 Toxic in contact with skin.
H331 Toxic if inhaled.
H373 May cause damage to organs *(liver, eyes, nervous system, circulatory system)* through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

P210 Keep away from heat/sparks/open flames/hot surfaces. — No smoking.
P273 Avoid release to the environment.
P370+P380 In case of fire: Evacuate area.
P373 DO NOT fight fire when fire reaches explosives.
P309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
P501 Dispose of contents/container in accordance with national and international regulation.

2.3. Other hazards

- PBT and vPvB assessment haven't carried out yet. The deadline required hasn't passed.
- Toxic combustion products: Nitric oxides(NO_x), Carbon oxides (CO, CO_2).

SECTION 3: Composition/information on ingredients

3.1. Substances

International Chemical Identification	Identyfikator substancji				Concentration
	EC No	CAS No	ONZ No	Index No	
CONSTITUENTS					
2,4,6-trinitrotoluene, TNT	204-289-6	118-96-7	0209	609-008-00-4	ca. 99,8%

SECTION 4: First aid measures

4.1. Description of first aid measures

4.1.1. First aid instructions by routes of exposure.

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Ensure patency of respiratory tract, protect against heat loss. In case of breathing depression if possible administer oxygen until normal breathing is resumed. If necessary, make artificial respiration. **Call a POISON CENTER or doctor/physician.**

IF ON SKIN: Gently wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.
IF CONTACT WITH EYES: Immediately wash with plenty of pure water for at least 10 minutes. Get medical advice/attention if you feel unwell. Contamination of eyes results in lachrymation, pain, redness of conjunctivas with a risk of damage to cornea.

IF SWALLOWED: After swallowing try to remove poison as soon as possible inducing vomiting (by administering water or water with medicinal charcoal and then provoking vomits by irritating posterior throat wall, e.g., with a finger). **Do not administer milk or alcohol**.Rinse mouth. **Immediately call a POISON CENTER or doctor/physician.**

4.1.2. Additional advice
Immediate medical attention is needed in the case of: oral exposure, problems with breathing, the occurrence of allergic symptoms such as edema, loss of consciousness and other symptoms indicating a health condition aggravated. If inhalation exposure: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

4.2. Most important symptoms and effects, both acute and delayed

Ways of exposure
Skin, respiratory tract, gastrointestinal duct**,** eyes.

Inhalation risk
Dust and possibly vapours cause coughing, headache, vomiting and shortness of breath, related to methemoglobinemia.

Swallowing risk
It may cause nausea, vomiting, headache and difficulties with breathing.

Contact with skin and eyes
Skin contamination causes its flushing and gradually increasing blue colouring, together with headache and shortness of breath. Contamination of eyes results in lachrymation, pain, redness of conjunctivas with a risk of damage to cornea.

Health effects of acute exposure
Poisoning may result in haemolytic or aplastic anaemia, liver damage.

Health effects of chronic exposure
Liver damage, anaemia, polyneural changes, chronic dermatitis, cataract.

4.3. Indication of any immediate medical attention and special treatment needed

General recommendation
In case of doubt or if symptoms persist, get medical advice. Show this material substance data sheet or label.
Recommendation for medical
The problems with breathing, administer oxygen.

SECTION 5: Fire-fighting measures

5.1. Extinguishing media

Suitable extinguishing media:
Carbon dioxide, extinguishing powders, medium or heavy foams, diffused water currents
Minor fire: extinguish with powder or carbon dioxide extinguisher.
Major fire: Do not attempt to extinguish large fire, evacuate area.

Unsuitable extinguishing media:

Light foams, compact water currents.

5.2. Special hazards arising from the substance or mixture

Explosion risk in case of fire. **DO NOT fight fire when fire reaches explosives.** If it is not possible to contain the fire very quickly, immediately withdraw from the area on fire, **evacuating everybody to the distance of minimum 800 m.**
Combustion products: Carbon oxides (CO, CO_2), nitric oxides(NO_x).

5.3. Advice for firefighters

Explosion risk in case of fire. **DO NOT fight fire when fire reaches explosives.** If it is not possible to contain the fire very quickly, immediately withdraw from the area on fire, **evacuating everybody to the distance of minimum 800 m.**
Minor fire: extinguish with powder or carbon dioxide extinguisher.
Major fire: **Do not attempt to extinguish large fire, evacuate area.**
Special protective equipment for firemen: Gas-tight protective suit with breathing apparatus insulating respiratory tract, face and head protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Use personal protective equipment as is recommended at point 8.
Avoid contacting with skin, eyes, breathing dust.
Remove sources of ignition, extinguish open fire, impose ban on smoking and on use of sparking equipment, avoid direct contact with released material.

6.1.2. For emergency responders

Use follows personal protective equipment: Non-static clothes (cotton), leather or rubber footwear, rubber gloves. When pouring or sieving dry trinitrotoluene use dust-proof mask or half-mask.

6.2. Environmental precautions

Do not wash into sewer. Do not let this chemical enter the environmental.

6.3. Methods and material for containment and cleaning up

Pick up spilled material into a sealed container using non-sparking tools and hand over to professional services for destroying. Contaminated product cannot be used in production.

6.4. Reference to other sections

When removing contamination, use with personal protection measures in accordance with the section 8.
Collected wastes remove in accordance with section 13.

SECTION 7: **Handling and Storage**

7.1. Precautions for safe handling

7.1.1. Work in a well-ventilated place, do not use sparking tools; avoid exposure to open fire, high temperatures, mechanical influences or friction. Don't smoke. **Warning! Explosion risk.**
Avoid spilling and dusting of the substance, don't breathe dust.
Avoid release to the environment.
7.1.2. When handling, do not eat or drink, avoid contact with the material, avoid inhaling of vapours and dust, observe personal hygiene principles, use personal protective equipment in accordance with the section 8. Don't smoke. After use, wash hands and take of f protective clothes and personal protective equipment before entering into lunchroom.

7.2. Conditions for safe storage, including any incompatibilities

Warehouse for explosives according to official regulations. Store in original sealed packaging in: dry, covered and protected from direct sunlight rooms, at temperature: -25 ÷ +30°C. TNT storage temperature mustn't exceed 30°C due to the properties of TNT. Relative humidity of storage of TNT mustn't exceed 50%. Materials assigned the same danger category can be stored in one storage area, storage in vicinity of concentrated acids, alkali, flammable things or substances is prohibited.
At the storage area don't smoke, don't eat, and don't use an open flame and sparking tools.

7.3. Specific end uses

Not expected any specific uses.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

	NDS (limit value – eight hours) mg/m^3	NDSch (limit value – short term) mg/m^3
Poland*)	1	3
Germany (AGS)	0,1	0,2
USA (OSHA)	1,5	-

*) Regulation of Minister of Work and Social Politics of 29.11.2002 in case of the most acceptable concentration and intensity of the harmful agents for health in work surrounding (Journal of Laws, 2002 No 217 item 1833), with the next changes, (Journal of Laws, 2005 No 212 item 1769, Journal of Laws, 2007 No 161 item 1142, Journal of Laws, 2010 No 141 item 950),
OSHA – Occupational Safety and Health Administration – USA
AGS – Committee stage for hazardous substances- Germany (Auschuss für Gefahrstoffe)

The biological limit values haven't been determined.

Monitoring in air at the workplace

PN-Z-04128-5: 1996 Air purity protection - Tests for content of nitrotoluenes - Determination of 2,4,6-trinitrotoluene in work places by gas chromatograph.

8.2. Exposure controls

Technical solutions:
Local exhaust ventilation with an enclosed dust emission area and general ventilation are necessary. Inlets of a local ventilation system located at work surface or below it. Outlets of a general ventilation system in the upper part of the room and near the floor. The ventilation systems must meet requirements set for fire or explosion hazard

Personal protective equipment:
Non-static clothes (cotton), leather or rubber footwear, rubber gloves. When pouring or sieving dry trinitrotoluene use dust-proof mask or half-mask and safety goggles. Analytical and research works related to the heating of the substance carry out in a fume cupboard.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Yellow solid in flake
Odour	Of nitro-compounds
Odour threshold	Missing data
pH	Does not concern
Boiling point	Decompose at 311°C
Flash point	240 °C
Flammability	Explosive material
Explosive properties	Heat of explosion: 4111 kJ/kg Volume of products of explosion: 739,5 dm^3/kg Sensitivity to shock : 14,7 J Sensitivity to friction : over 353N Mechanical sensitivity index Rm: 5,47 Sensitivity index Rw: 6,45 Thermal sensitivity index Rt: 7,60 Trauzl lead block 277 cm3 Hazard index: 0,82 Detonation speed : 6900 m/s
Oxidising properties	Not concern
Vapour pressure	1,99x10^{-4} mm Hg
Relative density	1,65 g/cm^3 (cristaline) 0,7-0,8 g/cm^3
Solubility	Dissolves in pyridine, acetone, methyl acetate, benzene, toluene, chlorobenzene, chloroform, ethyl ether, ethyl alcohol
Solubility in water	130 mg/dm^3 w temp 20 °C
Octanol-Water Partition Coefficient log K_{ow}	1,86
Viscosity	Missing data
Vapour density	Relative vapour density (air=1): 7,85
Evaporation rate	Missing data

9.2. Other information

Melting point/ freezing point: 80,20 °C

SECTION 10: Stability and reactivity

10.1. Reactivity

Explosive. The substance reacts with reducers dangerously. Forms highly explosive compounds in reaction with water solutions of bases, alcoholates and metals, sensitive to mechanic and thermal induction. Substance isn't pyrophoric.

10.2. Chemical stability

The product is stable provided that the appropriate handling of the substance in accordance with the MSDS.

10.3. Possibility of hazardous reactions

Explosive. The substance reacts with reducers dangerously. Forms highly explosive compounds in reaction with water solutions of bases, alcoholates and metals, sensitive to mechanic and thermal induction.

10.4. Conditions to avoid

Avoid high temperatures. Do not subject to grinding, shock, friction or concussion. When heated and burned, highly toxic nitric oxide is released, explodes when heated to 240°C. Keep away from heat, sparks, open flames, hot surfaces. Substance is sensitive to mechanical and thermal stimuli.

10.5. Incompatible materials

Concentrated acids and alkalis, flammable objects and substances.

10.6. Hazardous decomposition products

Nitric oxides(NO_x), Carbon oxides (CO, CO_2).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Toxicological data

Organism	Test Type	Route	Reported Dose (Normalized Dose)	Source
Cat	LDLo	oral	1850mg/kg (1850mg/kg)	Special Report Series--Medical Research Council Vol. 58, Pg. 32, 1921.
Cat	LDLo	subcutaneous	200mg/kg (200mg/kg)	Special Report Series--Medical Research Council Vol. 58, Pg. 32, 1921.
Mouse	LD50	oral	660mg/kg (660mg/kg)	Journal of Toxicology and Environmental Health. Vol. 9, Pg. 565, 1982. Link to PubMed
Rabbit	LDLo	oral	500mg/kg (500mg/kg)	Special Report Series--Medical Research Council Vol. 58, Pg. 32, 1921.
Rabbit	LDLo	subcutaneous	500mg/kg (500mg/kg)	Special Report Series--Medical Research Council Vol. 58, Pg. 32, 1921.
Rat	LD50	oral	607mg/kg (607mg/kg)	International Journal of Toxicology. Vol. 19, Pg. 169, 2000.

Hazard classes

Acute toxicity cat.3: Toxic if swallowed.

Acute toxicity cat.3: Toxic in contact with skin.

Acute toxicity cat.3: Toxic if inhaled.

Specific target organ toxicity — repeated exposure cat 2: May cause damage to organs *(liver, eyes, nervous system, circulatory system)* through prolonged or repeated exposure.

Available data

Ways of exposure

Skin, respiratory tract, gastrointestinal duct, eyes.

Inhalation risk

Dust and possibly vapours cause coughing, headache, vomiting and shortness of breath, related to methemoglobinemia.

Swallowing risk

It may cause nausea, vomiting, headache and difficulties with breathing.

Contact with skin and eyes

Skin contamination causes its flushing and gradually increasing blue colouring, together with headache and shortness of breath. Contamination of eyes results in lachrymation, pain, redness of conjunctivas with a risk of damage to cornea.

Health effects of acute exposure

Poisoning may result in haemolytic or aplastic anaemia, liver damage.

Health effects of chronic exposure

Liver damage, anaemia, polyneural changes, chronic dermatitis, cataract.

SECTION 12: Ecological information

12.1. Toxicity

Test Organism	Habitat	Biological Endpoint	Statistical Endpoint	Rezults [µmol/l]	Referens
Fish					
Pimephales promelas	Fresh water	Survival Behavior Totat length	96h LC50 96h EC50 9mo NOEC 9mo LOEC	10,6 2,0 0,02 0,06	[3]
Salamo gairdnerii	Fresh water	Survival	96h LC50	3,5	
Arthropods					
Ceriodaphnia dubia	Fresh water	Reproduct.	7d NOEC 7d LOEC	7,2 11,9	[3]
Bacteria					
Vibrio fischeri (Microtox)	Marine	Bioluminesc.	5min EC50 15min EC50 15min IC50 30min EC50	47,6 3,3 3,4 12,4	[3]

NOAEL - no-observed-adverse-effect level
LOAEL - lowestobserved-adverse-effect level
Hazardous to the aquatic environment. Chronic aquatic toxicity cat.2: Toxic to aquatic life with long lasting effects.

12.2. Persistence and degradability

The compound is hardly biodegradable. It stays in the environment for a long time. Therefore, avoid passing of this compound to surface water and soil.

12.3. Bioaccumulative potential

The distribution ratio of K_{ow} = 1.86 indicates that the compound accumulation level in plant and animal tissue, as well as compound accumulation and transfer in alimentary chain, should not be high. According to R 33 classification, there is a danger of compound accumulation in the organism.

12.4. Mobility in soil

2,4,6-trinitrotoluene may pass to the air due to detonation, open burning and shell emptying. Also, dust and gases may pass to the atmosphere, when emptying the shells. Water may be polluted by contaminated wastewater from production and/or processing. 2,4,6-trinitrotoluene may pass to the soil due to detonation and open burning. Due to relatively low vapour pressure ($1.99x10^{-4}$ at $20^{o}C$) and relatively high solubility in water (130 mg/l at $20^{o}C$), passing of 2,4,6-trinitrotoluene from water surface to the air is not expected. Also, passing of 2,4,6-trinitrotoluene from water to the sediment or soil in a considerable degree is not expected, on the basis of the value of absorptivity by active carbon.

12.5. Results of PBT and vPvB assessment

PBT and vPvB assessment haven't carried out yet. The deadline required hasn't passed.

12.6. Other adverse effects

Missing data.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste code: 16 04 03 – Other waste explosive (dangerous waste) – according to European list of wastes.
Never dispose of wastes by draining to the sewage system, avoid contamination of surface water and soil.
Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Domestic regulations:
The Act on wastes (Dz.U. (Journal of Acts) 07.39.251 with further amendments) dated in 27 April 2001.
The Ordinance of the Minister of Environment on catalogue of wastes (Dz.U. 01.112.1206) dated in 27 September 2001.
The Act on packaging materials and packaging wastes (Dz.U. 01.63.638 with further amendments) dated in 11 May 2001.

SECTION 14: **Transport information**

Transport shall be carried out in accordance with legal regulations described in point 15.1, sub-point 5. For ADR/RID (transport by land), IMDG (transport by sea), transport shall be carried out in accordance with:

14.1. Number UN	0209
14.2. Prawidłowa nazwa przewozowa UN	TRINITROTOLUENE (TNT), dry or wetted, containing less than 30 % of water by mass.
14.3. Transport hazard class(es) Classification code	1 1.1 D
14.4. Packing group	-
14.5. Environmental hazards	ENVIRONMENTALLY HAZARDUS.
14.6. Special precautions for user	No smoking, use of fire and open flame.
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not expected any transport in bulk.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

- The ordinance 1907/2006 (EC) of the European Parliament and Council, dated in 18 December 2006, on registration, evaluation, permissions and restrictions for chemicals (REACH), establishment of the European Agency of Chemicals, which amends the Directive 1999/45/EC and annuls the Ordinance of the Council No. 793/93 (EEC) and the Ordinance of the Commission No. 1488/94 (EC), as well as the Directive of the Council 76/769/ EWG and the Directives of the Commission 91/155/EEC, 93/105/EC and 2000/21/EC.
- Act on chemical substances and preparations of 11.01.01 (Journal of Laws, No11 item 84), as amended (Journal of Laws, 2001, No 100 item 1085, No 123 item 1350, No 125 item 1367; 2002 No 135 item 1145, No 142 item 1187, 2003 No 189 item 1852, 2004 No 96 item 959, No 121 item 1263, 2005 No 179 item 1485, 2006 No 171 item 1225),
- REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006,
- All the working with the product must be carried out according to the rules of the regulation of Minister of Work and Social Politics of 26.09.1997 in case of general safety regulations and work hygiene (Journal of Laws, 1997 No 129 item 844), uniform text (Journal of Laws, 2003 No 169 item 1650), with the next changes (Journal of Laws, 2007 No 49 item 330),
- Regulation of Minister of Work and Social Politics of 29.11.2002 in case of the most acceptable concentration and intensity of the harmful agents for health in work surrounding (Journal of Laws, 2002 No 217 item 1833), with the next changes, (Journal of Laws, 2005 No 212 item 1769, Journal of Laws, 2007 No 161 item 1142, Journal of Laws, 2010 No 141 item 950),
- Regulation of Minister of Economy, Employment and Social Policy of 9.07.2003 on health and safety at work in manufacturing, internal transport and handling of explosives, including pyrotechnic products (Journal of Laws, 2003 No 163 item 1577)
- International transport regulations RID, ADR and IMDG
- European Council Directive **96/82/EWG (Seveso II) of 9 December 1996 on the control of major-accident hazards involving dangerous substances** with the next changes: Directive 2003/105/EWG. (According to Directive Seveso is classified as explosive - cat. 5)

15.2. Chemical safety assessment

Chemical safety assessment hasn't carried out yet. The deadline required hasn't passed.

SECTION 16: Other information

Explanation to used warning symbols

E Explosive
T Toxic
N Dangerous to environment

Explanation to danger symbols (R)

R 2 Risk of explosion by shock, friction, fire or other source of ignition
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 33 Danger of cumulative effects
R 51/53 Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Explanation to used Hazard Classes

Expl. Explosive
Acute Tox. Acute toxicity
STOT RE Specific target organ toxicity — repeated exposure
Aquatic Chronic Hazardous to the aquatic environment. Chronic aquatic toxicity.

Explanation to Hazard statement Codes (H)

H201 Explosive; mass explosion hazard.
H301 Toxic if swallowed.
H331 Toxic if inhaled.
H311 Toxic in contact with skin.
H373 May cause damage to organs *(liver, eyes, nervous system, circulatory system)* through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

Explanation to precautionary statements (P)

P210 Keep away from heat/sparks/open flames/hot surfaces. — No smoking.
P370+P380 In case of fire: Evacuate area.
P273 Avoid release to the environment.
P373 DO NOT fight fire when fire reaches explosives.
P309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
P501 Dispose of contents/container in accordance with national and international regulation.

Advices concern training

Training concern applied explosive materials

Recommendations to apply restriction

All explosives are dangerous and must be carefully handled and used following approved safety procedures either by or under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, or ordinances.

More information

www.nitrochem.com.pl; e-mail: nitrochem@nitrochem.com.pl

Database

[1] Toxicological profile for 2,4,6-trinitrotoluene – U.S. Department of Health and Human Services (1955)
[2] Chemistry and Technology of Explosive Materials, T.1-3 – Tadeusz Urbański (1954)
and our learning.
[3] Ecotoxicology of explosives; Geoffrey I. Sunahara, Guilherme Lotufo Roman G. Kuperman, Jalal Hawari (2009)
Aim to achieve the Material Safety Data Sheet is description product only from the point of requirement of health, safety and environment protect.

Last changes

Point 1.1: registration number has been added;
Point 7.2 storage temperature has been changed.